Tektronix®

Z80
EMULATOR PROCESSOR
and
PROTOTYPE CONTROL PROBE
INSTALLATION
SERVICE

INSTRUCTION MANUAL

Tektronix®
COMMITTED TO EXCELLENCE

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

PLEASE CHECK FOR CHANGE INFORMATION AT THE REAR OF THIS MANUAL

This manual supports the following TEKTRONIX products:

8001 Options	8002A Options	8550 Options	8540 Options	Products
		2C	2C	8300E04 Opt. 01
		3D	3D	8300P04
	18			8002F18
	33			8002F33
03				8001F03

Z80 EMULATOR PROCESSOR and PROTOTYPE CONTROL PROBE INSTALLATION

SERVICE

INSTRUCTION MANUAL

Tektronix, Inc.
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PREFACE

About This Manual

This manual tells how to install the Z80 Emulator Processor module and Prototype Control Probe in TEKTRONIX microcomputer development systems utilizing 8300-series emulator processors.

This manual supports the Z80A Emulator Processor and Prototype Control Probe as well as the newer Z80B Emulator Processor and Prototype Control Probe. While the Z80A Emulator Processor can emulate only Z80 and Z80A microprocessors, the Z80B Emulator Processor can emulate the Z80, Z80A, and Z80B microprocessors.

In this manual, the term "Z80 emulator" is used in presenting information that applies to both the older Z80A emulator and the newer Z80B emulator. The term "Z80A emulator" is used for information that applies only to the Z80A Emulator Processor. The term "Z80B emulator" is used for information that applies only to the newer Z80B Emulator Processor.

Manual Organization

The Z80 Emulator Processor Installation Manual is divided into four sections:

- Section 1 contains general information about the Emulator Processor module and Prototype Control Probe.
- Section 2 contains information about jumper selection.
- Section 3 provides detailed installation procedures for the Emulator Processor module and the Prototype Control Probe.
- Section 4 describes procedures used to verify proper functional performance of the Emulator Processor module and Prototype Control Probe.

Change Information

Change information is located in the back of this manual in the CHANGE INFORMATION section. Change information should be entered into the body of the manual when the manual is received.

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OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accesible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

In This Manual

This symbol indicates where applicable cautionary or other information is to be found.

As Marked on Equipment

DANGER high voltage.

Protective ground (earth) terminal.

ATTENTION—refer to manual.

Use the Proper Fuse

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

SERVICING SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

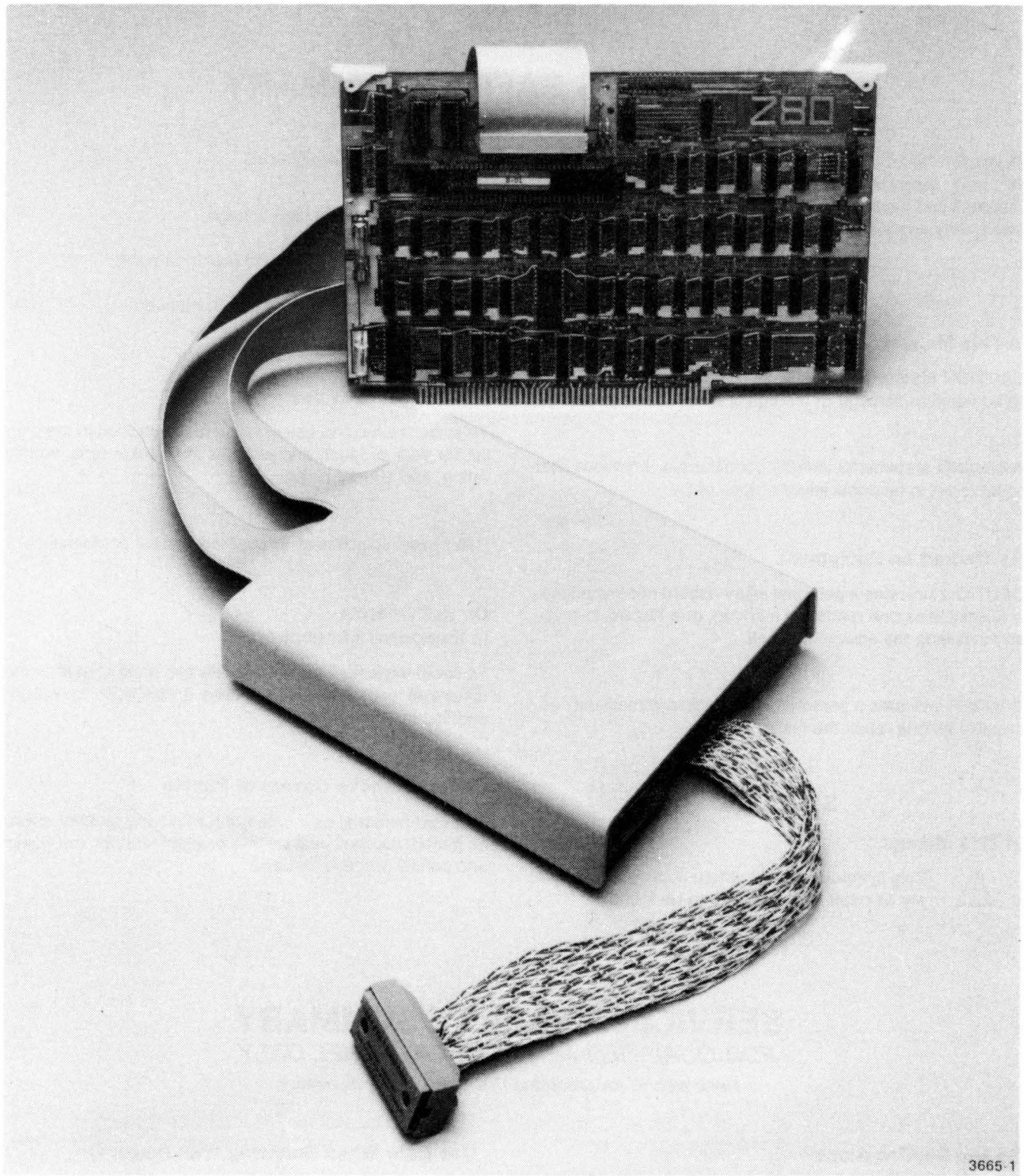
Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

Use Care When Servicing With Power On

Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.



Z80 Emulator Processor and Prototype Control Probe.

Section 1
GENERAL INFORMATION

Introduction

The Z80A Emulator Processor is an accessory designed to function as an integral part of your TEKTRONIX microcomputer development system. The Z80 Emulator Processor module, in conjunction with its Prototype Control Probe, emulates the operation of a Z80 or Z80A microprocessor. The Z80B Emulator Processor module, in conjunction with its Prototype Control Probe, emulates the operation of a Z80, Z80A, or Z80B microprocessor. The Z80A Emulator Processor utilizes a Z80A microprocessor device to perform the emulation function. The Z80B Emulator Processor utilizes a Z80B microprocessor device to perform the emulation function.

This manual contains procedures for installing a Z80 Emulator Processor module and its Prototype Control Probe in your TEKTRONIX microcomputer development system. (The Prototype Control Probe is not required for operation in emulation Mode 0.) This manual also contains performance verification procedures.

For user information about the Z80 Emulator Processor, refer to your System User's Manual and its Z80 Emulator Specifics supplement. Service information about the processor is provided in the optional Z80 Emulator Processor Service Manual.

Emulator Processor Module

The Z80 Emulator Processor module is a single circuit board that plugs into the main interconnect board in the system mainframe.

The Emulator Processor serves two purposes in the microcomputer development system. First, it has the ability to run a program written specifically for a Z80 microprocessor. With the help of other modules in the system, the Emulator Processor can check the program for run-time errors or program logic errors. Second, by attaching a Prototype Control Probe to the Emulator Processor module, a prototype circuit can be debugged and stepped through the final design stages to completion.

The Z80 Emulator Processor emulates the operation of a target Z80 or Z80A microprocessor device that will be used in the final version of a prototype system. Similarly, the Z80B Emulator Processor emulates a Z80, Z80A, or Z80B microprocessor device. The Emulator Processor responds to software in the same way as the target microprocessor, and also allows software debugging.

Modes of Operation

The Z80 Emulator Processor operates in one of three emulation modes. The desired emulation mode is selected by the user and controlled by the System Controller. The three emulation modes are:

MODE 0 (System Mode). Used to develop software for a prototype Z80 microprocessor-based circuit. Mode 0 uses your development system's Program Memory, I/O facilities, and clock to develop a software program. In emulation Mode 0, the development system acts as an independent Z80-based minicomputer. Prototype circuitry is not involved. Figure 1-1A illustrates Mode 0 operation.

MODE 1 (Partial Emulation Mode). Used to develop some of the hardware functions of the prototype circuit. The Prototype Control Probe is used with the Z80 Emulator Processor module in Mode 1. Emulation Mode 1 allows the prototype circuit's memory, I/O, and clock to be exercised. Mode 1 operation is illustrated in Fig. 1-1B.

Another function available in emulation Mode 1 is memory mapping. Memory mapping allows execution of user programs in combinations of prototype memory and Program Memory.

MODE 2 (Full Emulation Mode). Similar to Mode 1, except that prototype memory is now the single source of operation code; Program Memory cannot be accessed. Mode 2 operation is illustrated in Fig. 1-1C.

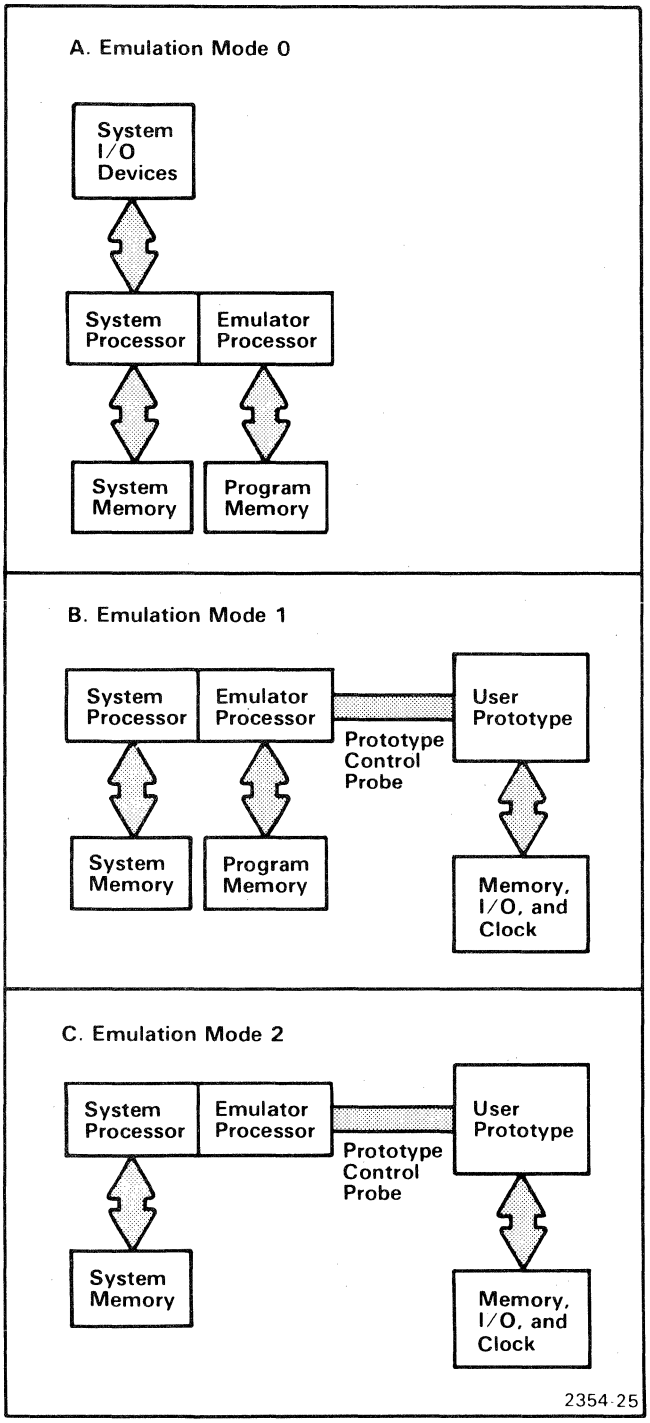


Fig. 1-1. Emulation Modes 0,1, and 2.

Prototype Control Probe

The Prototype Control Probe is the interface between the Emulator Processor module and the prototype circuitry. The Prototype Control Probe consists of the following.

1. A cable termination board.
2. Two 6-foot ribbon cables.
3. The interface assembly, containing the Driver/Receiver circuit board and the Mobile Microprocessor board.
4. Two 1.5-foot twisted-pair ribbon cables.
5. A 40-pin dual in-line (DIP) plug.

Figure 1-2 illustrates the Prototype Control Probe.

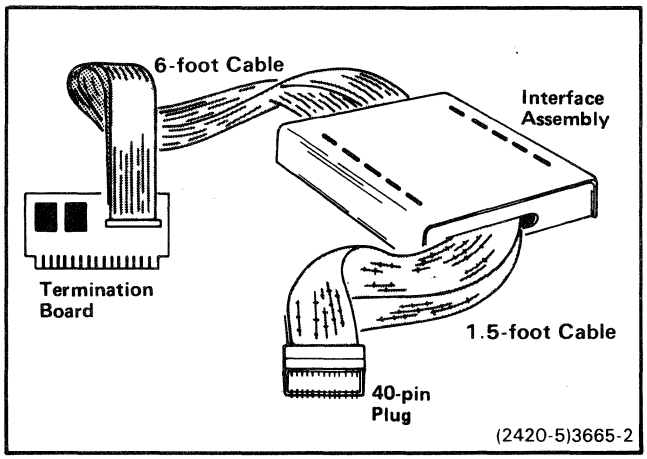


Fig. 1-2. Z80 Prototype Control Probe.

Mobile Microprocessor

The emulating Z80 microprocessor is located, along with line buffers and bus control circuitry, on a small auxiliary circuit board called the Mobile Microprocessor board. The Mobile Microprocessor board is installed either on the Emulator Processor module (Mode 0 only), or on the Driver/Receiver board in the Prototype Control Probe's interface assembly (if the probe is used).

When the Prototype Control Probe is not installed, the Mobile Microprocessor resides in connector J2 on the Emulator Processor module. This configuration is for emulation Mode 0 only (see Fig. 1-3).

When the Prototype Control Probe is attached to the Emulator Processor module, the Mobile Microprocessor board is installed in connector J3 on the Driver/Receiver board in the probe's interface assembly. All emulation modes are available in this configuration (see Fig. 1-4).

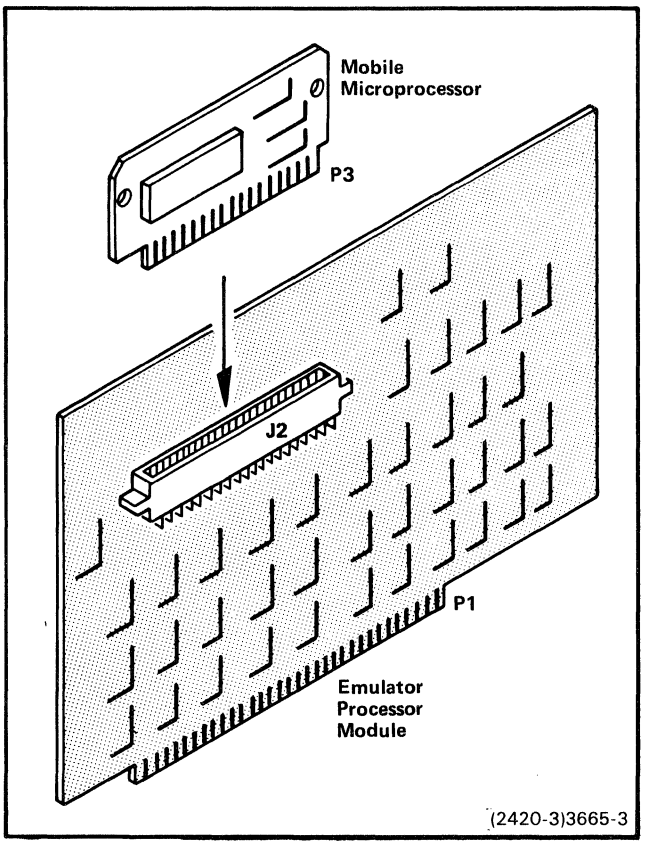


Fig. 1-3. Mobile Microprocessor, emulation Mode 0 only.

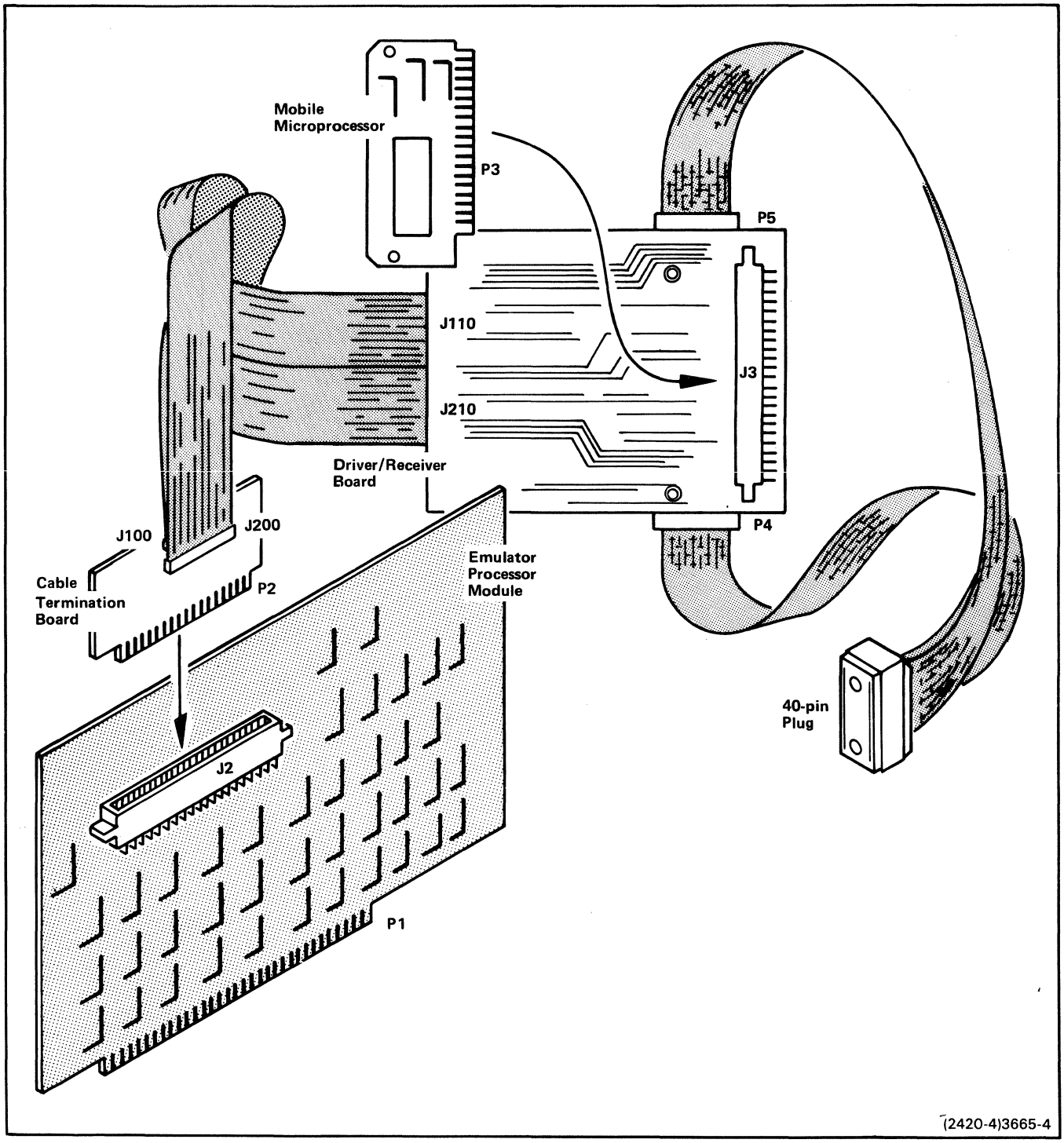


Fig. 1-4. Z80 Emulator Processor and Prototype Control Probe, emulation Modes 0, 1, and 2.

SPECIFICATIONS

Table 1-1
Electrical Characteristics

Characteristic	Performance Requirement	Supplemental Information
Supply Voltage	+5.2 V dc, ±5%	
Current (maximum)	Z80A, 1.6 A; Z80B, 2.3 A Z80A, 2.0 A; Z80B, 3.25 A	Without Prototype Control Probe With Prototype Control Probe
Power Dissipation	Z80A, 10 W (approx) Z80B, 17 W (approx)	

Table 1-2
Environmental Characteristics

Characteristics	Description	Supplemental Information
Temperature		
Operating (Z80A)	0°C to +70°C (+32°F to +158°F)	
Operating (Z80B)	+10°C to +40°C (+50°F to +104°F)	
Storage (Z80A)	−30°C to +80°C (−22°F to +176°F)	
Storage (Z80B)	−10°C to +65°C (+14°F to +149°F)	
Humidity (Z80A)	To 90% relative non-condensing (maximum)	
Humidity (Z80B)	20% to 80% relative non-condensing (maximum)	
Altitude		
Operating (Z80A)	4 500 m (15,000 ft) maximum	Derate maximum temperature by 1°C for each 300 m above 2 400 m.
Operating (Z80B)	2 500 m (8,000 ft) maximum	
Storage (Z80A)	15 000 m (50,000 ft) maximum	
Storage (Z80B)	12 200 m (40,000 ft) maximum	

Section 2
JUMPERS

Z80A JUMPERS

The Z80A emulator board contains two jumpers, J1 and J3. Jumper J1 selects between 2 MHz and 4 MHz as the system clock speed for emulation Mode 0. Jumper J3 is used to delete wait states in Mode 1. Figure 2-1 shows the locations of these jumpers.

The Z80A Driver/Receiver contains two jumpers. When you are mapped to system memory (Mode 1 only), jumper J1041 in the right-hand position makes MREQ unavailable to the prototype. J1041 in the left-hand position makes MREQ available to the prototype whenever HOLDA is not asserted.

When jumper J3051 is in the right-hand position, data fetched from program memory (Mode 1 only) does not appear at the probe tip. Jumper J3051 in the left-hand position causes data from program memory to be driven to the prototype. If jumper J3051 is to be used in the left-hand position, jumper J1041 must also be in the left-hand position.

NOTE

With jumper J3051 in the left-hand position, prototype bus contentions may exist.

Jumpers J1041 and J3051 are both shipped in the right-hand position.

Z80B JUMPERS

The Z80B emulator board contains four jumpers, J3003, J1059, J1061, and J1081. Figure 2-2 shows the locations of these jumpers.

Jumper J3003 selects between 4 MHz and 6 MHz as required for the desired clock speed for emulation Mode 0 (use only a clock speed of 4 MHz or below when used with a 8002A system).

J1059 is placed in the normal position when the Z80B processor is in interrupt Modes 1, 2, or Mode 0 single byte vectors. In this position, the interrupt data is gated in from the probe only while the IOREQ line is asserted low by the emulator processor.

J1059 is placed in the IM 0 MULTI position when the processor is in interrupt Mode 0 and there is a possibility of multi-byte instruction vectors.

NOTE

When J1059 is in the IM 0 MULTI position and if you are mapped to program memory, it is possible to get an additional short MEMREQ pulse at the probe tip during Mode 0 multi-byte interrupts and during emulation Mode 1 operation.

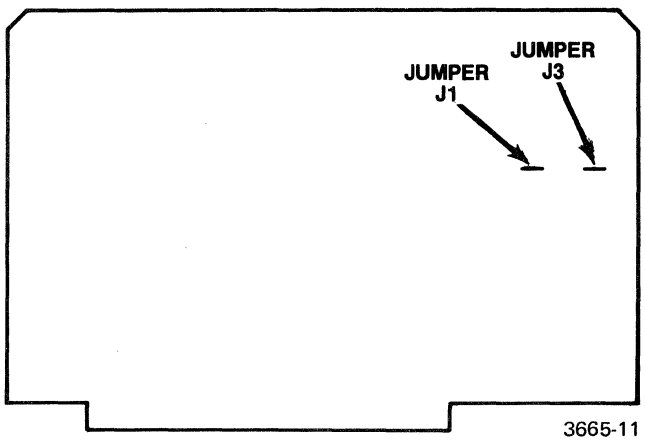


Fig. 2-1. Z80A Emulator Processor module jumper locations.

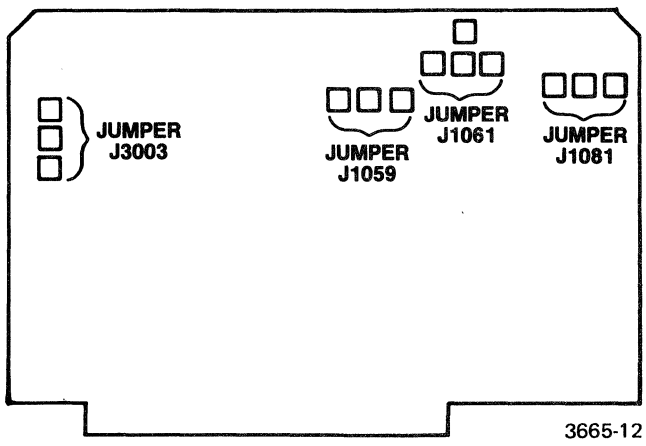


Fig. 2-2. Z80B Emulator Processor module jumper locations.

J1061 on the Emulator board controls the number of wait states. (The function selected with J1061 may interact with the function selected by J1081. See the discussion "4 MHz and Below", later in this section.) J1061 selects three functions:

- The WAITS position selects no wait state, and should be used only with 8540 or 8550 systems at 4 MHz and below.
- The 85XX position selects one wait state, and should be used only with 8540 or 8550 systems.
- The 800X position selects two wait states, and should be used only with 8001 or 8002A systems.

J1081 controls the modes of operation under which wait states are inserted. The positions required for various configurations of the systems are described in the following text.

8001/8002A Systems Jumper Configurations

- When J1081 is in the SLOW position, J1061 should be in the 800X position and J3003 should be in the 4 MHz position.
- Two wait states are inserted each time the program memory is accessed, or when running in emulation Mode 1.
- No wait states are inserted in Mode 2 except when operating in debug mode, or memswitch mode during the jump sequence. Two wait states are inserted in these modes.

8500-Series Systems Jumper Configurations

- **4 MHz and Below.** With P1081 placed in the SLOW position and P1061 placed in the WAITS position, no wait states are inserted in emulation Modes 0, 1, or 2. One wait state is inserted during forced jump sequence.
- **4 MHz to 6 MHz.** When operating between 4 and 6 MHz, the following conditions occur (J1061 in 85XX position). If operating in emulation Mode 1 and all memory is mapped to program memory, J1061 can be placed in WAITS position with no wait states in Modes 0, 1, or 2.

NOTE

Additional wait states can be generated by the user in emulation Mode 2 or emulation Mode 1 when memory is mapped to the prototype memory.

1. *J1081 in SLOW Position (used with 670-6542-00 and up memory boards).*
   a. *One wait state inserted in emulation Modes 0 and 1.*
   b. *No wait states inserted in emulation Mode 2 except during memswitch and forced jump operations when one wait state is inserted.*
2. *J1081 in FAST Position (not used with 670-6542-00 and up memory boards).*
   a. *No wait states inserted in emulation Modes 0 and 2.*
   b. *One wait state is added during forced jump, memswitch operations, and Mode 1.*

The Z80B Driver/Receiver contains two jumpers. When you are mapped to system memory (Mode 1 only), jumper J1041 in the right-hand position makes MREQ unavailable to the prototype. J1041 in the right-hand position makes MREQ unavailable to the prototype. J1041 in the left-hand position makes MREQ available to the prototype whenever HOLDA is not asserted.

When jumper J3051 is in the right-hand position, data fetched from program memory (Mode 1 only) does not appear at the probe tip. Jumper J3051 in the left-hand position causes data from program memory to be driven to the prototype. If jumper J3051 is to be used in the left-hand position, jumper J1041 must also be in the left-hand position.

NOTE

With jumper J3051 in the left-hand position, prototype bus contentions may exist.

Jumpers J1041 and J3051 are both shipped in the right-hand position.

Section 3
INSTALLATION PROCEDURES

INTRODUCTION

The following procedures tell how to install the Z80 Emulator Processor and its Prototype Control Probe in your TEKTRONIX microcomputer development system.

CAUTION

Under no circumstances can more than two Emulator Processor modules be installed in any TEKTRONIX microcomputer development system at one time. Excessive power supply loading will result.

EMULATOR PROCESSOR MODULE

1. Verify that primary power (115 or 230 V ac) to the microcomputer development system is off.

2. Remove the cover retainers at the upper corners on the rear of the mainframe (Fig. 3-1).

3. Remove the top cover by sliding it straight back, then set it aside.

NOTE

If a Prototype Control Probe is to be installed with the Emulator Processor, skip to the installation procedures for the Prototype Control Probe. If your system is to be operated without a Prototype Control Probe, continue to step 4.

4. Facing the front of the mainframe, hold the Emulator Processor module by its upper edges and align it with other modules in the mainframe, with its component side facing left.

5. Guide the module down the vertical channels at either of positions J15 or J16 on the main interconnect board (refer to Fig. 3-2).

6. When the module reaches the connector on the main interconnect board, press down firmly and evenly on the top edge of the module until it snaps into place.

7. Slide the top cover back into the guide tracks at the top of the mainframe. Be sure the cover is properly seated in the slot at the front of the mainframe guide tracks.

8. Install the cover retainers (removed in step 2) at the upper corners on the rear of the mainframe (Fig. 3-1). Tighten the cover retainer screws securely.

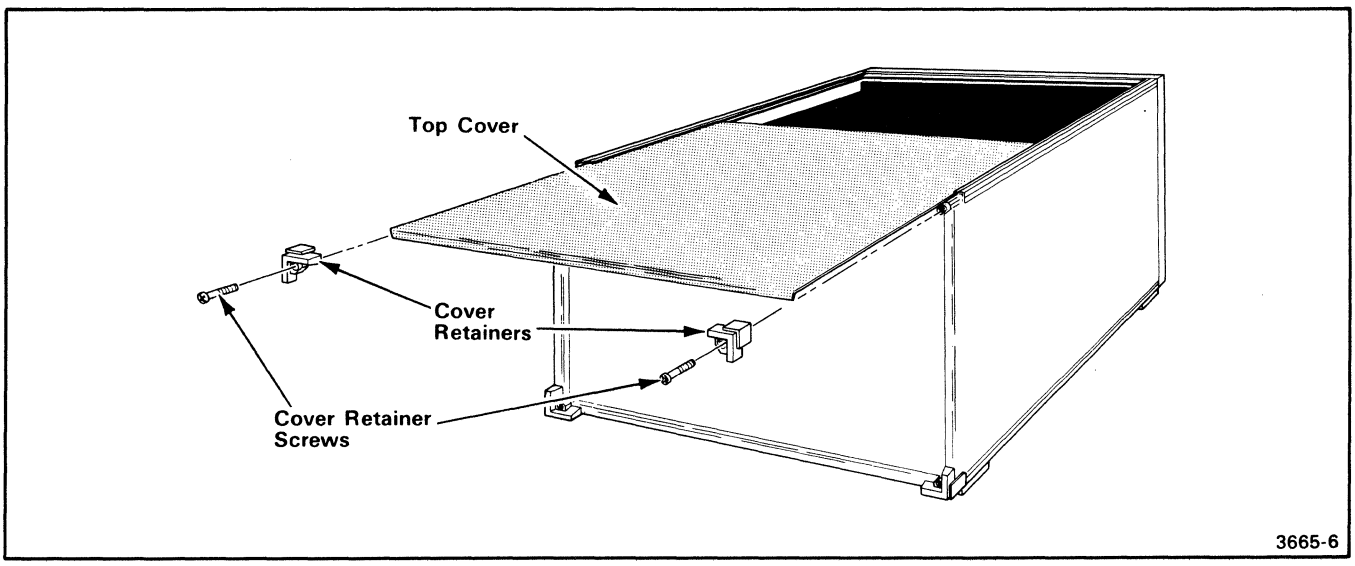


Fig. 3-1. Removal/installation of top cover.

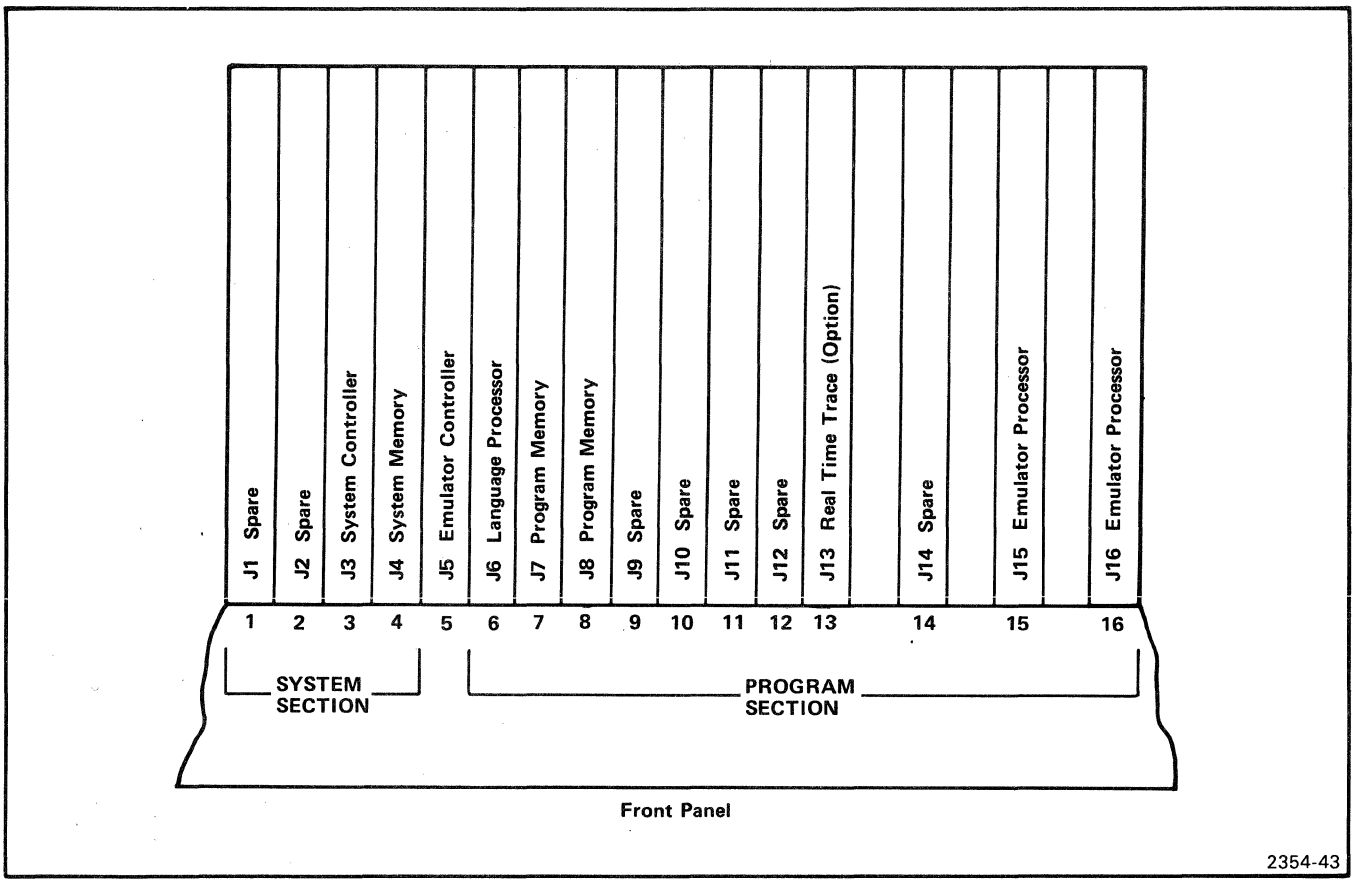


Fig. 3-2. Recommended module arrangement.

PROTOTYPE CONTROL PROBE

1. Perform steps 1 through 3 of the installation procedures for the Emulator Processor module.

2. Lay the Emulator Processor module (component side up) on a flat, static-free surface near the right side of the development system mainframe.

3. The Mobile Microprocessor is a small circuit board residing in J2 on the Emulator Processor module. Remove the two screws that secure the Mobile Microprocessor board to the Emulator Processor module.

4. Remove the Mobile Microprocessor board from connector J2. To remove the board, insert a small flat-bladed screwdriver between the Mobile Microprocessor board and one end of connector J2. Pry up gently until the Mobile Microprocessor board disengages from connector J2.

CAUTION

The microprocessor device on the Mobile Microprocessor board is subject to damage by static discharge when the board is not installed in its socket. Be very careful when handling the Mobile Microprocessor board. Hold the circuit board by its edges only. When storing or shipping the Mobile Microprocessor board, wrap the board in a conductive material such as conductive foam or pink polyethylene.

5. Lay the Mobile Microprocessor board on a conductive material such as pink polyethylene. The Mobile Microprocessor will be installed in the probe interface assembly in a later step.

6. Remove the two mounting screws at the top and bottom of the strain relief plate (Fig. 3-3), then remove the strain relief/cable clamp assembly from the rear panel.

7. Remove the three hex nuts (with lock washers) that attach the cable clamp assembly to the strain relief plate (Fig. 3-4). Set the strain relief plate aside.

NOTE

Each ribbon cable has a grounding plate bonded to it. The grounding plate must make contact with the grounding bar of the cable clamp assembly.

8. Mount the grounding plates of the long Prototype Control Probe ribbon cables on the cable clamp assembly; use one grounding bar for each ribbon cable. Secure the cable clamps with hex nuts (with lock washers). (Refer to Fig. 3-3).

9. A small termination board is located at the end of the long Prototype Control Probe ribbon cable pair. Carefully guide this termination board through the cableway opening from the rear of the mainframe, then pull enough of the ribbon cable through the opening to allow the termination board to reach the Emulator Processor module (near the right side of the mainframe, step 2).

10. Insert the termination board edge connector into connector J2 on the Emulator Processor module. Ensure that pin 1 of the termination board is aligned with pin 1 of connector J2.

11. Install the two screws (removed in step 3) through the mounting holes of the termination board and into the mounting posts on the Emulator Processor module. Tighten the screws securely.

12. Facing the front of the mainframe, hold the Emulator Processor module by its upper edges and align it with other modules in the mainframe, with its component side facing left.

13. Guide the module down the vertical channels at either of positions J15 or J16 on the main interconect board (refer to Fig. 3-2).

14. When the module reaches the connector on the main interconnect board, press down firmly and evenly on the top edge of the module until it snaps into place.

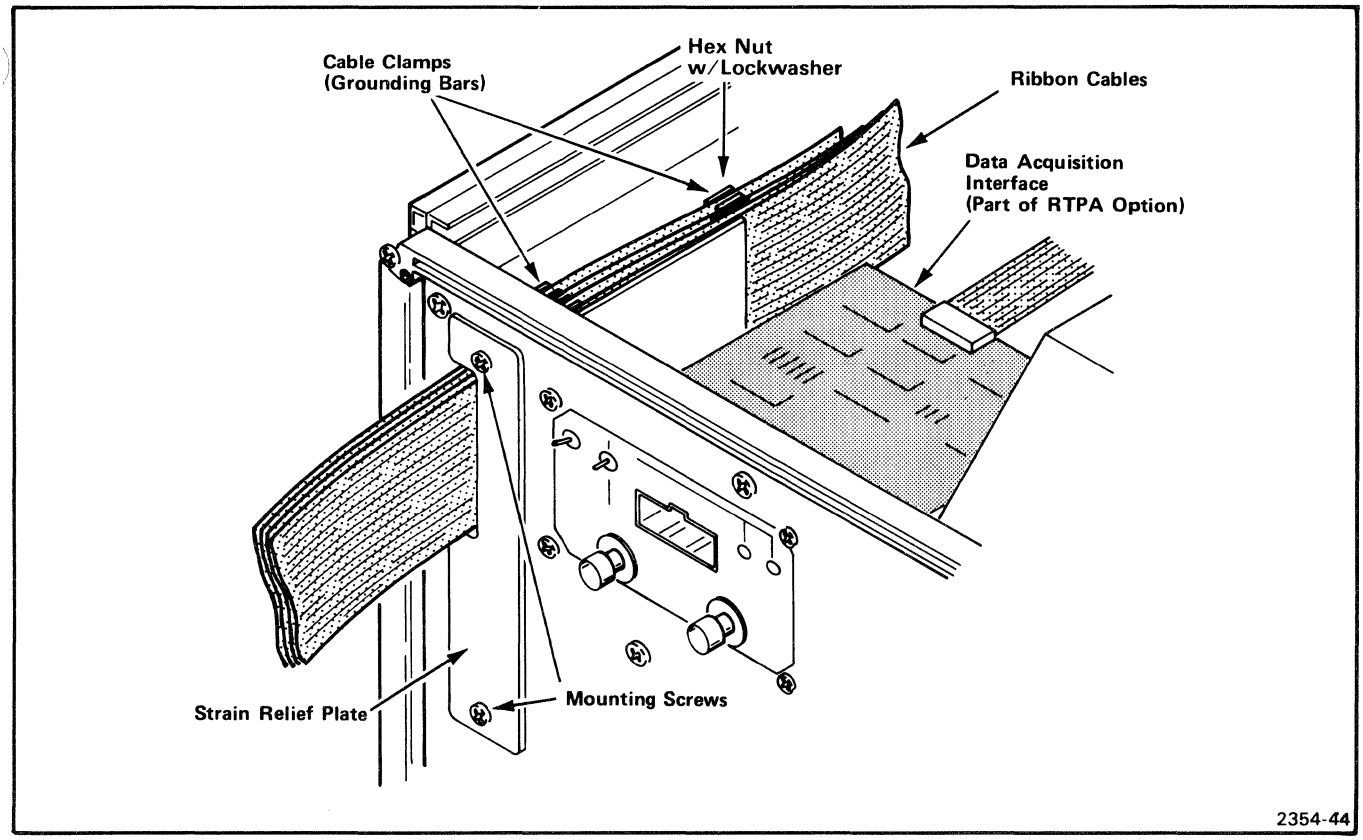


Fig. 3-3. Ribbon cable installation and grounding.

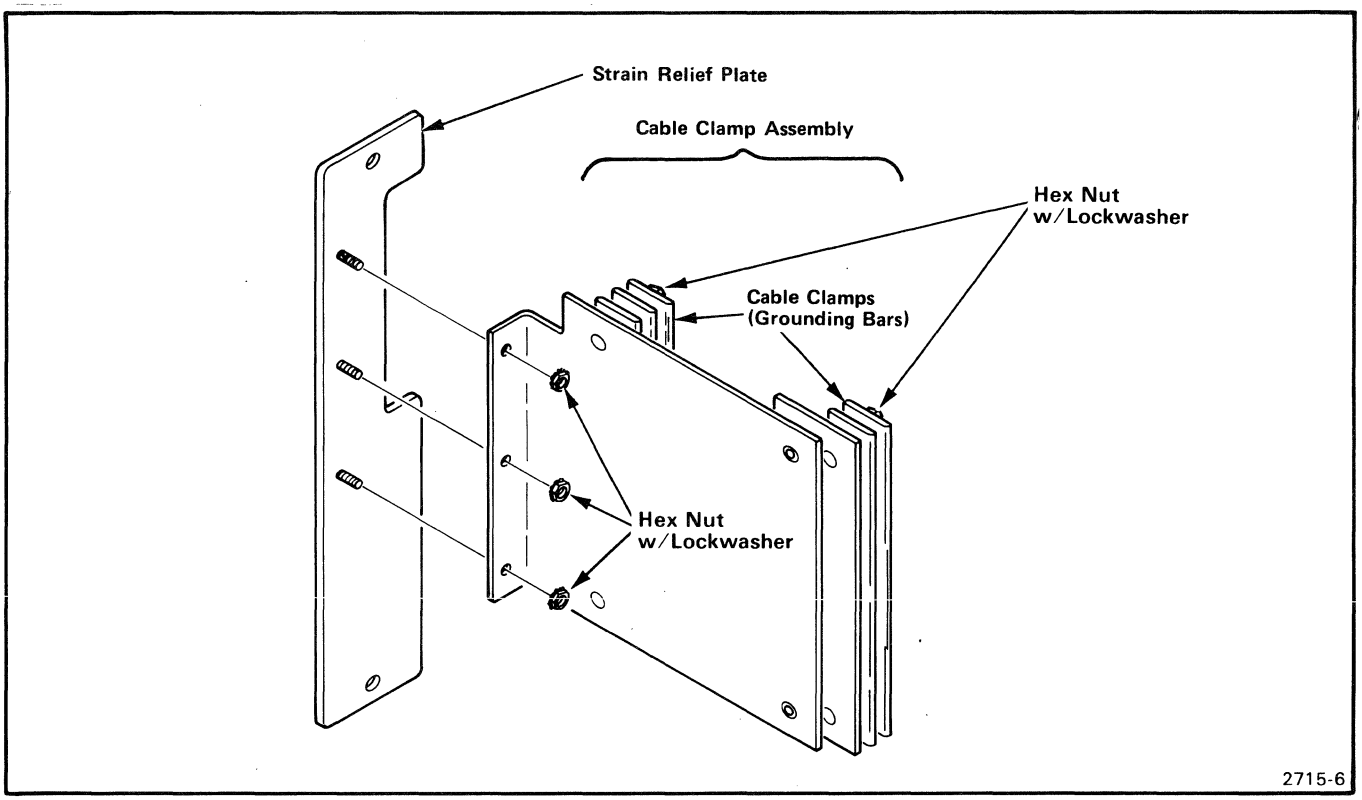


Fig. 3-4. Strain Relief/Cable Clamp Assembly details.

15. Dress the probe cables along the cableway, then guide the cable clamp assembly through the cableway opening in the rear panel of the mainframe until the assembly is clear of the rear panel.

16. Attach the strain relief plate to the cable clamp assembly, using the three hex nuts (with lock washers) removed in step 7 (Fig. 3-4).

17. Guide the strain relief/cable clamp assembly into the cableway opening, then attach the strain relief plate to the rear panel, using the two screws removed in step 6 (Fig. 3-3).

NOTE

To ensure proper grounding of the ribbon cables, mating surfaces on the strain relief plate and the mainframe rear panel must be free of paint and dirt, and mounting screws must be tightened securely.

18. Slide the mainframe top cover into the guide tracks at the top of the mainframe. Be sure the cover is properly seated in the slot at the front of the guide tracks.

19. Install the cover retainers at the upper corners on the rear of the mainframe (Fig. 3-1). Tighten the cover retainer screws securely.

20. Now install the Mobile Microprocessor board according to the following procedure.

MOBILE MICROPROCESSOR BOARD

If you plan to use a Prototype Control Probe with your development system, the Mobile Microprocessor board must be installed in the probe's interface assembly. Your interface assembly has either a plastic or a metal housing. Follow the housing disassembly procedures that apply to your interface assembly.

Plastic Housing Disassembly

1. Remove the four screws at the corners on the bottom of the interface assembly housing.

2. Remove the top cover of the interface assembly and set it aside.

3. Remove the three mounting screws from each side of the Driver/Receiver circuit board.

4. Lift the circuit board slightly and unplug connectors P4 and P5.

5. Tilt the circuit board upward as necessary to gain access to connector J3 on the back side of the board.

Metal Housing Disassembly

1. Remove the screws near the four rubber feet on the bottom of the interface assembly housing.

2. Remove the top cover of the interface assembly and set it aside.

3. Unplug cable connectors P4 and P5 from the Driver/Receiver board.

4. Remove the three mounting screws from each side of the Driver/Receiver circuit board.

5. Tilt the circuit board upward as necessary to gain access to connector J3 on the back side of the board.

Mobile Microprocessor Board Installation

6. Remove the two screws from the mounting posts on the Driver/Receiver circuit board (Refer back to Fig. 1-4.)

7. Insert the Mobile Microprocessor board into connector J3. Be sure the component side of the Mobile Microprocessor board faces away from the Driver/Receiver circuit board.

8. Using the two screws removed in step 6, secure the Mobile Microprocessor board to the Driver/Receiver circuit board.

9. Reassemble the interface assembly in reverse order of steps 1 through 5 for the appropriate housing.

CONNECTING TO THE PROTOTYPE

The 40-pin plug at the end of the 1.5-foot twisted-pair cables fits into the Z80 microprocessor socket on the prototype. Pin 1 on the plug must be mated with receptacle 1 on the socket. A notch is located near pin 1 on both the protective spring-loaded plate and the body of the plug, to aid in pin identification (see Fig. 3-5).

If you are using a zero-insertion-force (ZIF) socket for the microprocessor on your prototype, you should insert a standard low-profile 40-pin DIP socket between the probe plug and the prototype's ZIF socket, to ensure a secure mechanical and electrical connection (see Fig. 3-6).

CAUTION

If the Prototype Control Probe plug is incorrectly inserted in the prototype socket, damage to the Prototype Control Probe will result. Figures 3-5 and 3-6 show the proper method of plug insertion.

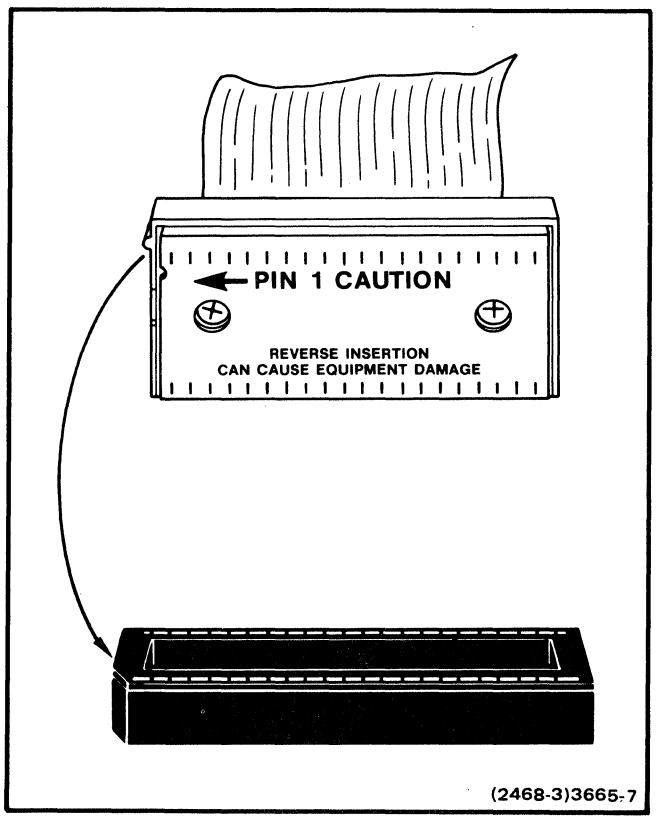


Fig. 3-5. Pin identification and proper plug insertion.

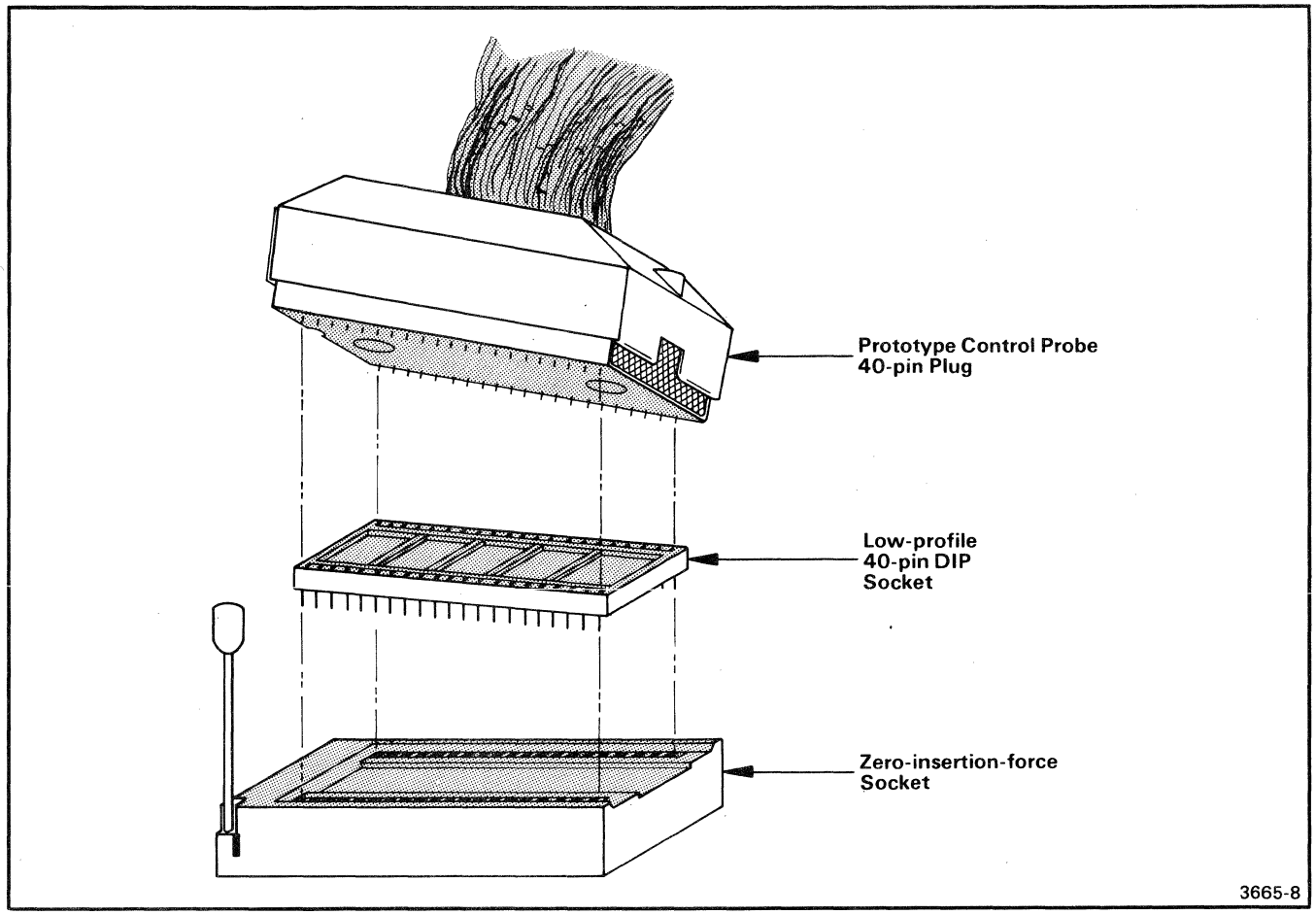


Fig. 3-6. Using a zero-insertion-force socket.

GROUNDING

A proper ground system is mandatory for satisfactory operation of your microcomputer development system. The Emulator Processor module and its Prototype Control Probe, as well as any other optional and peripheral equipment, must be properly grounded to eliminate ground loops and to reduce susceptibility to static discharge. Figure 3-7 illustrates system grounding for a typical development system. The following grounding procedures are recommended.

- Ensure that primary power cords of all units (including your protective system) are connected to outlets that are on the same ground system.

- Attach all grounding strap lugs to the chassis of any unit being grounded. Ensure that the lugs make good contact with bare metal; remove any paint, protective coating, or dirt from the metal before attaching the grounding lug.

- When installing a Prototype Control Probe, tighten the two strain relief plate mounting screws (Fig. 3-3) securely to ensure a good ground connection between the strain relief/cable clamp assembly and the rear panel of the mainframe.

INSTALLING 8540 OPTION ROM

When you are installing a new 8540 option or installing an 8550 to 8540 Option Conversion Kit, it is necessary to install Option ROM devices on the System ROM board. There is no requirement for the ROM to be installed in specific sockets. However, it is recommended that the option ROM be installed in the following locations.

- The Emulator Option ROM should be installed in the sockets labeled CS82 through CS8B as shown in Fig. 3-8 (circuit numbers U1010 through U1070 and U3010 through U3070 on the System ROM board).

- Install the PROM Programmer Option ROM in locations CS90 and CS91 as shown in Fig. 3-8 (circuit numbers U1110 and U1120 on the System ROM board).

- The Communications Option (COMM Option) ROM should be installed in location CS8F as shown in Fig. 3-8 (circuit number U4060 on the System ROM board).

- Install the Trigger Trace Analyzer Option ROM in locations CS8E, CS8D, and CS8C as shown in Fig. 3-8 (circuit numbers U4050, U4030, and U4010 on the System ROM board).

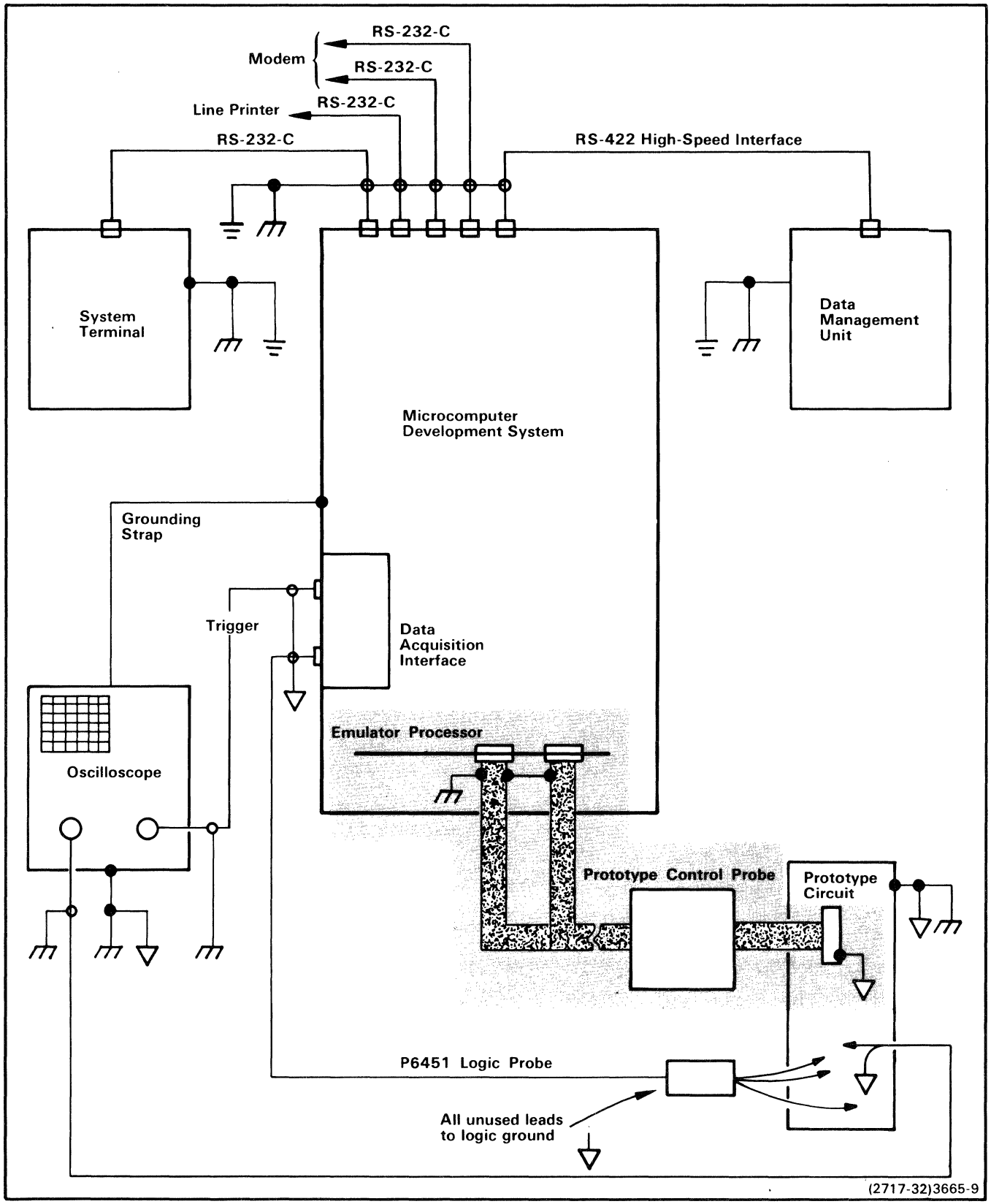


Fig. 3-7. Typical system grounding.

The spare ROM sockets for options are limited. When you add or replace Emulator Processor Boards, it may be necessary to remove unneeded ROM to allow installation of required ROM.

Figure 3-8 shows the locations and the assigned labels for the 32 ROM sockets on the System ROM board.

REDUCING DELAY THROUGH THE PROTOTYPE CONTROL PROBE (Z80B ONLY)

The clock test point (on the Driver/Receiver board) can be used to obtain more accurate emulator timing under worst-case conditions above 4 MHz operation. In order to use the clock test point, you must disconnect the prototype clock input pin from the prototype logic, and reconnect it directly to the clock test point in the Prototype Control Probe using a plug-on connector.

The clock test point is located on the output of U1050 (pin 18 through a 68 Ω resistor in series), and the output is within 10 ns of the actual CPU clock. When the prototype clock is connected directly to the clock source in the Prototype Control Probe, the 20 ns delay through probe circuitry is circumvented. Figure 3-9 illustrates the standard configuration and the adapted configuration for the prototype circuitry when implementing this clock test point user adaptation.

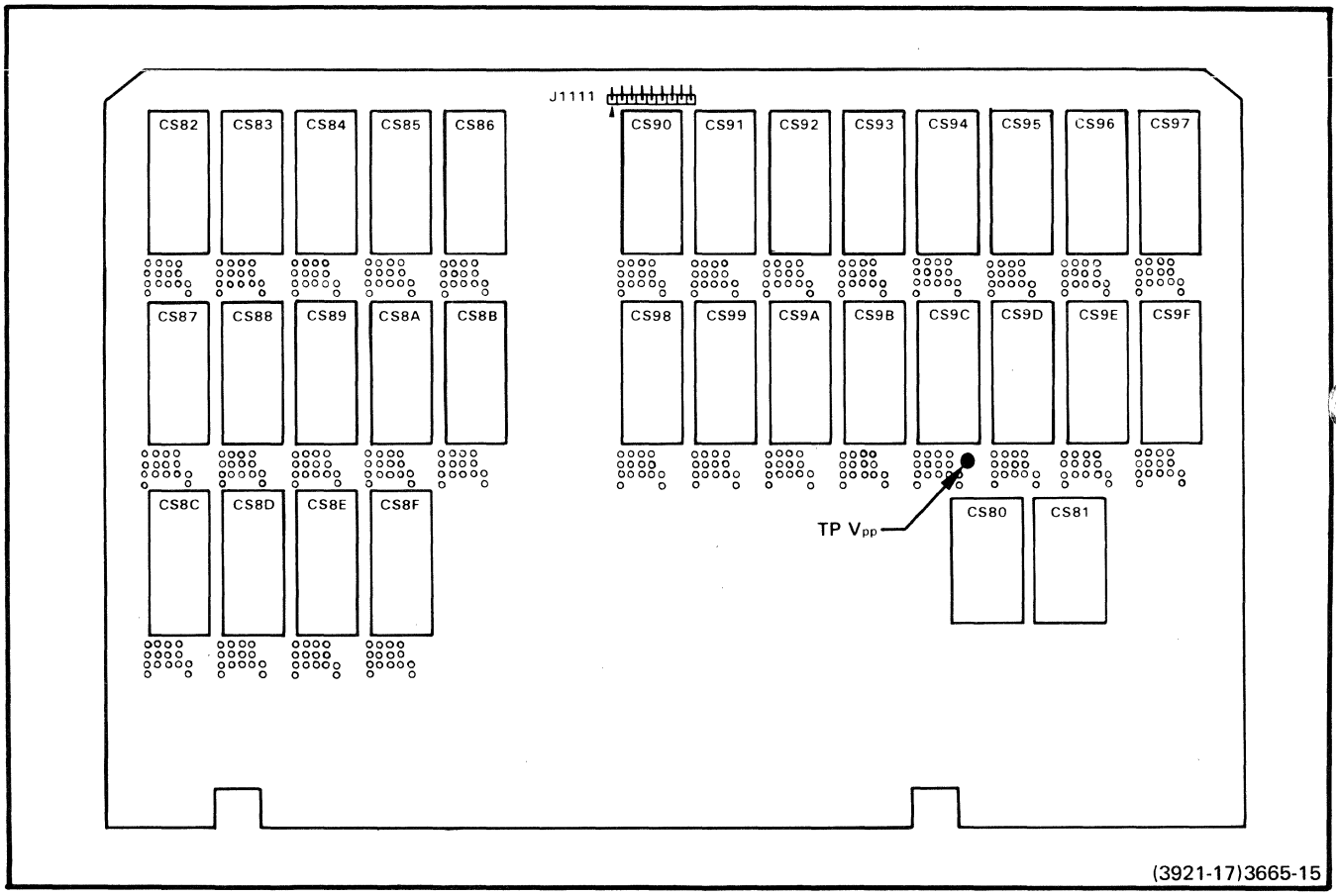


Fig. 3-8. System ROM board socket locations.

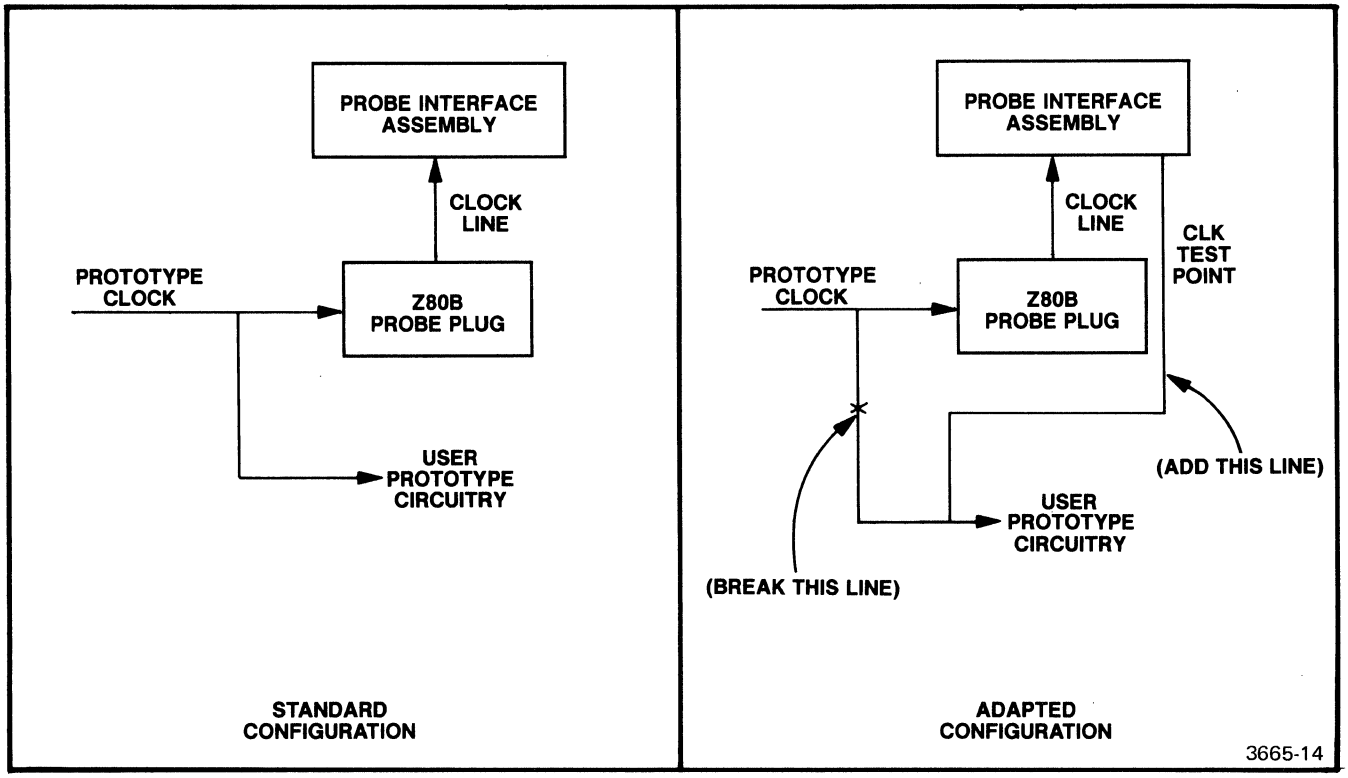


Fig. 3-9. Connecting the prototype clock input directly to the Prototype Control Probe.

Section 4
PERFORMANCE VERIFICATION

INTRODUCTION

After you have installed the Z80 Emulator Processor and Prototype Control Probe in your microcomputer development system, the Emulator Processor should be tested for proper operation. The first part of this section discusses equipment necessary to verify functional operation of the Z80 Emulator Processor and Prototype Control Probe. Equipment necessary to verify timing relationships of signals available at the Prototype Control Probe pins is discussed in the second part of this section.

Each time you install the Z80 Emulator Processor in your development system, system verification checks should be performed. Emulator processor diagnostics are run automatically as a part of the system diagnostic test program. Procedures for running this diagnostic test program are included in your System Installation Guide.

This section explains details of operation that are specific to the Z80A and the Z80B Personality Card circuit boards. You are assumed to be familiar with the operation of the MicroLab I, as outlined in the MicroLab I Instruction Manual. You are also assumed to be familiar with the operation of the Z80A and Z80B microprocessors, as outlined in the Zilog Z80A/Z80B Technical Manual.

PERFORMANCE VERIFICATION

Equipment Required

To verify functional performance of the installed Z80 Emulator Processor, the following equipment is required:

- TEKTRONIX MicroLab I (067-0892-00 and up)
- Z80 Personality Card (018-0156-00 and up)

The MicroLab I checks the Z80 Emulator Processor and Prototype Control Probe by providing a circuit with known characteristics. This circuit is monitored by MicroLab I circuitry, and test results are indicated on the LED display. The MicroLab I operating system also contains tests that functionally exercise the Emulator Processor and its Prototype Control Probe.

The information presented in this section assumes that you are familiar with the MicroLab I and its characteristics. For more information about this equipment, refer to the MicroLab I Instruction Manual (with the Z80 Personality Card supplement).

Test Procedures

Equipment Setup

1. Ensure that primary power (115 or 230 V ac) to the microcomputer development system and to the MicroLab I is off.

2. Verify that jumper J1018 (Z80A card only) or J4015 (Z80B card only) is installed on the Z80 Personality Card (see Fig. 4-1 and Fig. 4-2).

3. Install the Z80 Personality Card in the MicroLab I.

NOTE

To ensure a secure mechanical and electrical connection between the Prototype Control Probe's 40-pin DIP plug and the zero-insertion-force (ZIF) socket on the personality card, attach a standard 40-pin DIP circuit board socket to the probe plug, then plug the socket pins into the ZIF socket.

4. Plug the Z80 Prototype Control Probe's 40-pin DIP plug into the ZIF socket on the Z80 Personality Card.

Functional Test Procedure

1. Turn on primary power to the microcomputer development system.

2. Turn on power to the MicroLab I test fixture.

NOTE

For detailed information on operating procedures for your microcomputer development system, refer to your System User's Manual.

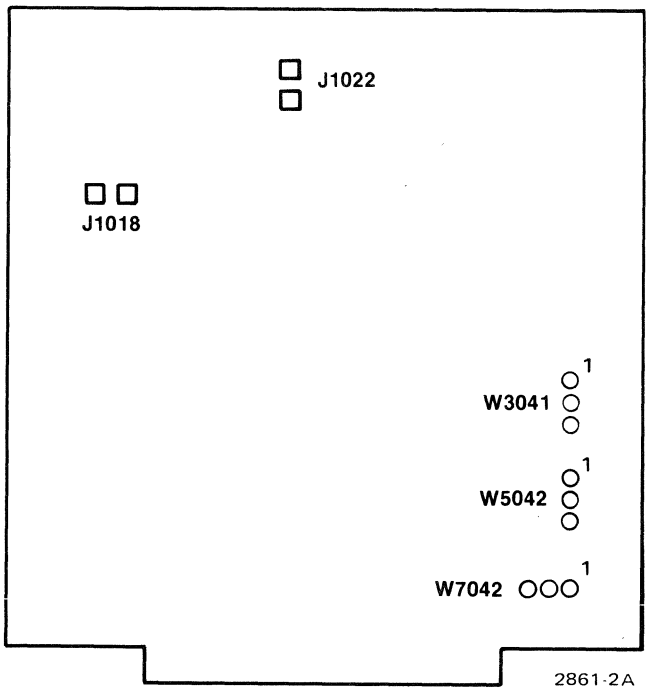


Fig. 4-1. Z80A Personality Card jumper and strap locations.

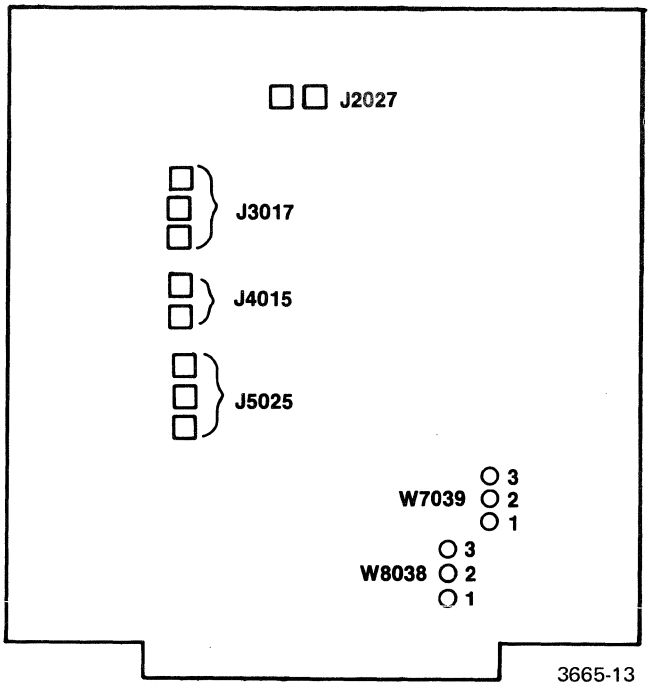


Fig. 4-2. Z80B Personality Card jumper and strap locations.

3. At the system terminal, enter the following command line:

```
>SEL Z80   <CR>
```

This identifies the Emulator Processor to be tested.

4. Enter the desired emulation mode.

a. To verify memory mapping capability, enter:

```
>EM 1   <CR>
```

When the prompt character (>) is displayed, enter:

```
>MAP U 0000 FFFF   <CR>
```

b. If only the functional operation of the Emulator Processor is to be tested, enter:

```
>EM 2   <CR>
```

5. To initiate program execution in the Emulator Processor, enter:

```
>RESET   <CR>
>GO 0   <CR>
```

If the Z80 Emulator Processor and Prototype Control Probe are operating properly, the MicroLab I will operate normally and display HELLO. This display indicates that most of the Z80 Emulator Processor logic circuitry is functioning properly. However, several control lines are not checked during initialization and should be verified with the Processor Test.

No HELLO Display

If the MicroLab I LEDs do not display HELLO, a problem in the Z80 Emulator Processor module, the Prototype Control Probe, or the MicroLab I is indicated. The following procedure may be used to determine which unit is malfunctioning:

1. Turn off power to the MicroLab I and the microcomputer development system.

2. Disconnect the Prototype Control Probe from the ZIF socket on the Z80 Personality Card.

NOTE

The Z80 microprocessor device is subject to damage by static discharge when not installed in its socket. Be very careful when handling this device; hold it by its ends only and do not touch the pins. When the device is not in use, it should be stored in its conductive foam packing.

3. Obtain an Z80 microprocessor device that is known to be operating properly. Install the device in the ZIF socket on the Z80 Personality Card.

4. Turn on power to the MicroLab I test fixture.

If the MicroLab I now displays HELLO, the problem is in either the Emulator Processor module or the Prototype Control Probe. Refer to the optional Z80 Emulator Processor Service Manual for corrective maintenance information.

If HELLO is not displayed, a malfunction of the MicroLab I is indicated. Refer to the MicroLab I Instruction Manual for corrective maintenance information.

Processor Test Procedure.

1. Press the RESET key on the MicroLab I keypad. This initializes the processor test hardware in the MicroLab I.

2. Press the PROC TEST (Shift 1) key to start the Processor Test. The display will show Pn.

3. Press the 0 key. The MicroLab I will begin the Processor Test sequence at PROC 0 and perform each of the Processor Tests in order. While each test is being performed, the display will show Proc x (where x is the number of the test being performed).

For the Z80 Emulator Processor and Prototype Control Probe, there are four Processor Tests:

PROC 0 Test of the BUSRQ and BUSAK lines. An Error P0 display indicates a problem with either the BUSRQ line or the BUSAK line.

PROC 1 Test of the RFSH line. Error P1 indicates a problem with the RFSH line.

PROC 2 Test of the operation of the INT and HALT lines. AnY will appear on the MicroLab I display, prompting you to press any key except SPECIAL or RESET. Error P2 indicates a malfunction of either the INT line or the HALT line.

PROC 3 Test of the WAIT line. There is no error message associated with this test; if the WAIT line malfunctions, the behavior of the monitor is unpredictable. When PROC 3 is completed, rEAdY will be displayed on the MicroLab I.

Successful completion of both the Functional Test and the Processor Test verifies that the Z80 Emulator Processor and Prototype Control Probe are operational.

EMULATOR TIMING VERIFICATION

You may occasionally wish to verify timing relationships between the signals available at the pins of the Prototype Control Probe. The following paragraphs discuss equipment necessary to perform these timing verifications.

Specifics of these timing relationships are provided in the Z80 Emulator Specifics section of your System User's Manual.

Measurement Considerations

Verifying the timing relationships of Emulator Processor signals involves measurement of very small time increments. Test equipment used for these measurements should be able to resolve timing differences between two signals of 5 ns or less. A resolution of 1 ns is preferred for verification of the most critical timings.

Be careful that errors are not introduced by the test equipment being used. Test equipment calibration should be checked carefully. If you are using a dual trace oscilloscope, rather than a dual beam model, be sure to account for any possible skew between the two input channels. In general, good laboratory measurement practices should be followed to ensure accurate measurement of these timing relationships.

Equipment Required

The following equipment may be used to measure timing relationships with the preferred accuracy and resolution:

- TEKTRONIX 7844 Dual Beam Oscilloscope, or equivalent;
- TEKTRONIX 7A26 Vertical Amplifier, or equivalent; and
- TEKTRONIX 7B85 Delaying Time Base, or equivalent.

Controlling the Signal Lines Under Test

Some processor signal lines, such as interrupt lines, are normally connected to asynchronous circuits. Timing relationships of these asynchronous signals may be difficult to measure with an oscilloscope. To exercise these signal lines in a periodic manner, you may find it necessary to develop software routines, or use an external test fixture such as the TEKTRONIX MicroLab I.